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EFFECT OF INTERCROPPING OF SESAME AND SUNFLOWER ON PEANUT IN NEWLY RECLAIMED SOILS

BY

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CHAPTER 1

INTRODUCTION

Increasing system is especially beneficial for small farmers in the low-input high risky environment of the developing areas of the world. It is perhaps the best example of how interactions between crops can be exploited to produce considerable yield benefits. Intercropping can achieve much larger yield than sole crops by using environmental resources more fully over time or more efficiently in space **(Willey *et al.*, 1983).**

Egypt agriculture has the advantage of enjoying rich endowments of nature of and man-made resources, with favorable temperature and abundance of sunshine available throughout the year. Since the cultivated area in Egypt is limited the agriculture intensification had become urgent necessity to optimize the utilizing of unit area.

Growing two or more crops together on the same land is a traditional cropping system in areas of many tropical countries. These practices were known as intercropping or mixed cropping depending on whether the crops are sown in separate rows or mixed within the row, respectively, and it can produce higher and more yields than those from sole crops.

Intercropping as one of the multiple cropping systems has been practiced by farmers for many years in various way and most areas. Intercropping is practiced not only for risk avoidance but also to maximize resource use efficiency and monetary return. Small farmers in many countries are seriously constrained by low crop productivity and limited land resources. Preliminary, research has shown that possible means of increasing the productivity on these farms would be through intercropping. At present much of the research on intercropping is being conducted at international institution in Africa, Asia and Latin America **(Francis, 1986).**

Peanut (*Arachis hypogaea*, L.) is considered to be one of the important edible oil crops in Egypt. About 35-40 % of the total seed production in Egypt exported. Among oil seed crops, peanut has an important target to overcome oil efficiency gab in Egypt. Peanut production needs light soils which restricted in Eastom Delta region and Western Delta (South Tahrir) or in middle Egypt where about 80-85 of peanut areas are cultivated. Intercropping with sesame and sunflower was a trial to introduce on oil crops in peanut area to increase oil production **(Gabr, 1998 and El-Sawy *et al.*, 2006).**

Sesame (*Sesumum indium*, L.) is an important oil seed crop in the world and Egypt. Sesame seed is a rich source of oil and protein contents **(Gaber, 1998).** Intercropping gave higher values of LER and relative Net return greater than unity **(Dahatonde *et al.*, 1996).**

Sunflower (*Helianthus annuus*) as an important oil crop ranks the second after soybean with respect to oil production in the world. In Egypt there is a great need to increase the cultivated area with sunflower by its planting in the newly reclaimed soils **(Bassal *et al.*, 2003).** Intercropping with sunflower is a trial to introduce an oil crop in peanut areas to increase oil production **(Ruyashekhar *et al.*., 1997).**

Nitrogen plays essential role in plant biochemistry and physiology. Nitrogen fertilizer of intercropping crops causes increases plants population density **(Kenkates *et al.*, 1996 and Samira *et al.*, 2000).**

The present investigation aimed to the effect of intercropping sesame and sunflower on peanut under nitrogen fertilization levels on growth, yield and yield components.

CHAPTER 2

REVIEW OF LITERATURE

The literature dealing are the effect of there intercropping patterns sesame and sunflower on peanut under three nitrogen fertilizer levels on growth, yield and yield components of three crops.

2.1. Effect of intercropping systems:-

Desal and Goyal (1980) provided studies on intercropping of sesame (*Sesamum indicum* Linn) with bunch and spreading groundnut (*Arachis hypogeal* inn), Caster (*Ricinus communis* Linn), Soybean (*Glycin max* Linn *merr*) and sunflower (*Helianthus annuus* Linn). Intercropping increased the total oil seeds production. Planting of sesame at a distance of 45 cm was better than of 30 cm.

Malithano and Van Leeuwen (1982) found that mixed cropping was more productive, indicating its usefulness as a cultivation technique to the small farmer.

Farah *et al.* (1983) found that maize was grown alone or intercropped with groundnut. It was sown on the normal date or 7 days earlier or later than normal. They found that dry matter and grain yield were significantly affected by intercropping. Maize grain yields were 3.99 – 4.9 t/ha. Groundnut yields were decreased from 2.02 t/ha in pure stands to 0.28 – 0.58 t/ha in intercrops.

Nikam *et al.* (1984) found that sunflower intercropped in groundnuts under different sowing systems increased the total pods +seed yield and total oil yield.

Samui *et al.* (1984) indicated that intercropping of groundnuts with sunflower in ratios of l:l, 2:1 or 1:3 and given 0, 40 or 80 kg N/ha were gave total yields were about 80,52, 50 and 5% higher for the 4 ratios, respectively, than were obtained by growing the crops alone. Stem yields showed a somewhat similar trend.

Franje and Pave (1985) found that groundnuts CV. Bp1.81g was intercropped with maize as main crop at 26.6, 44.4, 50.0 or 53.3 x103 plants/ha. The number of marketable ears of maize/ha increased with increasing population density. Groundnut yield was not affected by intercropping but agronomic performance was improved positive response of maize population densities of 26.6 and 50.0 x 103 plants/ha. The results indicated that a substantial yield advantage of the intercrop combination over the corresponding monoculture.

Griesh (1985) studied inter and intra competition between groundnut and sesame when they were intercropped peanut and sesame were examined at three planting distances each. Sesame and groundnut spacing were at 20, 25 and 30 cm. for peanut and 15, 20 and 25 cm for sesame. His data revealed that sesame height increased as planting distance was decreased. There were consistent and significant decrease in number of branches, fresh and dry weight of leaves/plant, leaf area and leaf area index followed the same trend.

Data revealed that decreasing sesame planting distance within the row to 15cm. significantly decreased fruiting branches/plant, the number of capsules/plant and seed yield/plant. Seed yield/feddan also followed same trend. On the other hand, intercropping sesame with peanut grown at 25cm apart gave the highest 1000 seed weight. Growing sesame plants at distance 25cm. apart within the row gave seeds with high oil content. Data revealed that the calculated values of LER, RCC and A showed that there was no interspecific competition between both components when intercropped. Each component was found to be neither dominant non dominated .Intercropping did not provide yield advantage compared to sole cropping.

Lee (1985) found that groundnut yield were not affected in 3:1 mixtures with sesame and sesame seed yield were reduced in all mixtures compared with pure stands.These mixtures gave 20% increase in total yields in the two crops and were the most economic combination.

Madkour (1985) found that the effect of Ala on plant height of soybean was not pronounced as Mayak did. Mayak variety was more vigorous than Ala and consequently proved to show more competitive abilities.

Kulkarni and Sojitra (1986) show that nodulation, plant growth and N content and pod yields were decreased in groundnuts intercropped with sesame, sunflowers, soybean or cowpeas, compared with groundnuts in pure stands.

Asokaraja *et al.* (1987) studied intercropping of red gram (*Cajanus cajan*), cotton and maize in rows 1.5 or 2.25m apart with groundnuts.

Groundnuts grown at a spacing of 22.5x15 cm had no significant adverse effects on groundnut yield. The intercrops gave addition all yields and increased net returns.

Hulihalli and Sheelavantar (1987) showed that intercropping of groundnuts and pigeonpeas in 5:1 rows ratio with pigeonpeas population at 75% gave the highest total pod and seed yields of 2.60 t/ha compared with 1.55 t/ha for groundnuts and 1.62 t/ha for pigeonpeas in pure stands, when groundnut and pigeonpea were intercropped in 3:1, 4:1 and 5:1 row ratios with pigeonpeas as 25, 50, 75 or 100% of population and with groundnut population at 100% also.

Sharma and Meusingh (1987) indicated that intercropping sesame with peanut in all intercropping systems decreased the yield of both sesame and peanut, compared with pure stand. They indicated that all intercropping patterns gave a land equivalent ratio over one.

Sermsri *et al.* (1987) found that intercropping roselle with groundnut at row spacing of 55 cm with or without 25 kg N/ha reduced roselle yields by 4.18 % and groundnut yield by 67-85 % .The combined yield of both crops increased with increasing row spacing with N whether rows were paired or not, but without N this trend was lost. The groundnut, roselle yield, roselle ratio was affected by row spacing, year and N supply.

Calavan and Weil (1988) studied the effect of intercropping systems of maize and peanut. Number of pods, number of mature pods and weight of seeds/pod was decreased by intercropping. Also yield of pods/ha decreased. They obtained the land equivalent ratio (LER) of 1.38.

Mohamed *et al.* (1988) demonstrated that l: l cropping system of sesame/cotton did not affect number of pods of sesame plant in the 1st season, but significantly decreased in 2nd season. Also yield of sesame/fed decreased by intercropping.

Abdel – Gawad *et al.* (1989a) found that the highest seed yield/fed of soybean was obtained by planting sunflower and soybean of 30 ridges with 3:3 intercropping patterns.

Mandal *et al.* (1989) found that soybean, groundnut, mung beans and black gram sown with rice produced more pods/plant, seeds/pod and had higher 1000 seed weight when grown alone than intercropped.

Misbahulmunir *et al.* (1989) found that intercropping maize with peanut reduced peanut seed yield from 33 to 49% of sole crop yields.

Shinde *et al.* (1989) studied in a field trial cajaus cajan cv.icpl – 87 and groundnut cv.uf. 70103 were grown alone or intercropped with row ratios 1:2, 1:3, 2:2 and 2:4 sowing took place on 21 Feb.and cajanus cajan plants were harvested twice on 26 July and I August, while groundnut was harvested on 19 July. Highest yields were produced from monocropped. *Cajanus cajan* and groundnut and which recoded to 1.67 and 3.60 t/ha, respectively. A 2:2 row ratio produced the highest *Cajanus cajan* yields (1.00 t/ha) and seed protein quantity (203 kg/ha) out of all intercropping systems. A 1:3 row ratio produced groundnut yields equivalent to the monocropped control, were dry pod and oil yields were 3.27 and 1.03 t/ha, respectively. The efficiency of intercropping based on land equivalent ratio was highest in the 1:3 row ratio systems which gave 23% biological advantage.

Attia and El-Bially (1990) reveled that relative crowding coefficient values were greater than one by intercropping maize with soybean or sunflower, as when soybean intercropped with sunflower. The increase in alternating ridges number in creased the values of relative crowding coefficient, land equivalent ratio. (L.E.R) was greater than 1.0 under intercropping patterns for all intercrops and reached the highest values under 3:3 pattern 42.2, 36.4 and 40.5% for maize – soybean, maize- sunflower and soybean – sunflower, respectively. Aggressivity values under intercropping patterns on nitrogen fertilization were positive for maize, whereas for soybean were positive only when intercropped with sunflower.

El-Gamel *et al.* (1990) found that the effect of combined fertilizer rate in pure stand of sesame significantly increased plant height and seed yield/fed and found that 1:1 cropping system of sesame with groundnut decreased number of capsules/plant, yield/plant and seed yield/fed of sesame compared with pure stand sesame. Also, found the plant height, the average number of pods/plant, yield/plant and yield/pod when growing sesame on the other side of groundnut ridge was higher than that when sesame was grown on the top of groundnut ridges. They found that 1:1 cropping system significantly decreased

number of pods of groundnut/plant, number of seeds/pod, seeds/ plant, pods yield/plant and pods yield/fed compared to the pure stand of groundnut. In competitive relationship data indicate that nor any intercrop combination had an adverse effect on land use efficiency, in addition, agressivity values were positive for sesame and groundnut was dominated crop.

El-Mihi *et al.* (1990) found that growth of sesame and groundnut wether in pure stand or in association under different systems and plant spacing increased to maximum when sesame was spaced at 20cm. The effect of sesame orientation with groundnut was less pronounced with a relatively higher value when sesame was grown on the other side of groundnut ridges. The results indicated that sesame on groundnut heights when sesame was orientated on the other side of groundnut ridge were significantly higher than those orientated on the top of groundnut ridge. Date on groundnut yield and yield components indicated clearly that values of almost traits when sesame was orientated on the top of groundnut ridge were significantly less than sesame grown on the other side of the ridges. Yield data indicated that while the yield/plant were not statistically influenced by intercropping pattern, widening spacing between plants resulted in significant increases in yield. Yield/fed maximized when plant were spaced at 20cm. apart, Spacing at 25 cm ranked the second, whereas, plants grown at 15 cm between hills gave minimum yield. LER_s of sesame all over the intercrop combinations were rather higher than those of groundnut and total land equivalent ratio maximized when sesame spaced at 20cm and grown on the other side of the ridge (1.68) while was (1.56) when sesame was grown on the top of groundnut ridge. Positive aggressivity was associated with sesame all over the treatments imposed.

Gajendra (1990) studied the effect of pigenopea on groundnut intercropping under rainfed conditions and mentioned that in a field trial pigenopea was intercropped with groundnut in six cropping systems involving sole pigenopea at 50cm, sole groundnut at 30cm, paired row planting of pigeonpea at 30/70cm + one row of groundnut, paired row planting of pigenopea at 30/20 cm+ two rows of groundnut, uniform rows of pigenopea at 180cm five rows of groundnut. He found no significant differences in number of pods/plant, pod yield/plant and seed index of groundnut in all cropping system used. But cropping of pigenopea with groundnut significantly decreased the number of pods/plant, pod yield/plant and pod yield/ha of groundnut compared to pure stand of groundnut and obtained the land equivalent ratio (LER) of 1.9.

Kamel *et al.* (1990) indicated that significant differences between monoculture and intercropped plants in favors of the first for both components significant differences were also. Caused by varying degree of competition, existing due to the contrast nature of the two varieties of sunflower cotton received the greatest pressure from Mayak variety which had positive aggressivity values, where as it was negligible with hybrid pioneer total land equivalent ratio was better when hybrid pioneer substituted Mayak in the intercrop association. Varietal rouctin was also not respectively to intercropping pattern or thinining.

Rao *et al.* (1990) showed that intercropped pearl millet (pennisetum americanum) with groundnut in 1:1, 1:2, 1:3, 1:4, 1:5, 2:2, 2:3, 2:4 or 2:5 row ratios. Within – row spacing of p- americanum plants was 120,60,30,15 or 7.5 cm giving 2.8 – 44.4 plants/m^2. *P. amerianum* yield was unaffected by plant population, but it was reduced by